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| **Subject** | BIOLOGY | **Grade** | 9 |  |
| **Student** |  | **Date** |  |

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| **ASSESSMENT TASK – PRACTICAL DESIGN ANALYSIS (TRANSPIRATION VIRTUAL LAB)** |
| Sometimes, it is unfeasible to perform an experiment in class, whether because of time, cost, availability of materials, or some other cause. In the case of using a potometer (*poto* = drink, *meter* = measurer) to measure the water released by transpiration in a plant, many things can go wrong! It is very time consuming, prone to experimental error, and not particularly exciting. For this reason, we will perform a virtual experiment!  The planning portion of this experiment will be done in reverse. First, you will complete the virtual laboratory. Then, you will complete a form in which you analyze it (variables, controls, method, etc.). This provides you with an opportunity to study the design of an experiment so that in the future, when designing your own experiments (important for the diploma programme), you will have something to compare to.   * Complete the virtual experiment * Find and complete the laboratory design template on the class wiki * For controls and constants, only list what is relevant (i.e. the density of liquid water is a constant, but not important to this experiment) * Be brief with your answers! One sentence is fine for everything except for *Scientific explanation for prediction* * Explain which type of graph would be most appropriate to present this data * Provide a step-by-step summary of how the experiment would be done in real life   This section of the report will be graded on **Criterion B**.  The analysis of your data will be done as usual. You will present the results, analyze the results in a conclusion, and evaluate the experimental method in the evaluation.   * Present all relevant data in **a single table** * **Create a graph** that helps visualize the results * Remember to include all appropriate **titles**, **labels**, and **units** * In a **conclusion**: Restate the results, provide a scientifically supported explanation for the results, and decide whether you should **accept or reject the hypothesis** * In an **evaluation**: Discuss any issues with the experiment itself and provide suggestions for how they could be improved (Hint: For this experiment, you *may* discuss the fact that it was done virtually)   This section of the report will be graded on **Criterion C**.  Your report will be submitted electronically, either via e-mail or TurnItIn.  It will be done **individually**. If you work together, certain answers may be the same (i.e. the name of a variable), but anything requiring an explanation must be in your own words. |

**CRITERIA AND ASSESSMENT RUBRICS**

**Criterion B: Inquiring and Design**

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| **Level** | **Level descriptor** | **Application to project** | **Student** | **Teacher** |
| 0 | The student does not reach a standard described by any of the descriptors below. | The report is incomplete or unsatisfactory. |  |  |
| 1-2 | The student is able to:  i. **select** a problem or question to be tested by a scientific investigation.  ii. **select** a testable prediction.  iii. **state** a variable.  iv. design **a method with limited success**. | 1. The research question is vague or irrelevant 2. A hypothesis is suggested 3. Variables are correctly identified 4. The experimental method is vague or unclear |  |  |
| 3-4 | The student is able to:  i. **state** a problem or question to be tested by a scientific investigation.  ii. **state** a testable prediction.  iii. **state** how to manipulate the variables, and **state** how **data** will be collected.  iv. design **a safe method** in which he/she **selects materials and equipment**. | 1. The research question is related to the experiment 2. A hypothesis is suggested and explained logically 3. Some variables, ranges and methods of manipulation are correctly identified 4. The experimental method would require previous knowledge of the experiment to be performed correctly |  |  |
| 5-6 | The student is able to:  i. **state** a problem or question to be tested by a scientific investigation.  ii. **outline** a testable prediction.  iii. **outline** how to manipulate the variables, and **state** how **relevant data** will be collected.  iv. design **a complete and safe method** in which he/she **selects appropriate materials and equipment**. | 1. The research question is related to the experiment and transpiration 2. A hypothesis is suggested and explained scientifically 3. All variables listed have their ranges and methods of manipulation are correctly identified 4. The experimental method would require previous knowledge of the experiment to be performed correctly |  |  |
| 7-8 | The student is able to:  i. **outline** a problem or question to be tested by a scientific investigation.  ii. **outline** a testable prediction **using scientific reasoning**.  iii. **outline** how to manipulate the variables, and **outline** how **sufficient, relevant data** will be collected.  iv. design **a logical, complete and safe method** in which he/she **selects appropriate materials and equipment**. | 1. The research question is an exploration of transpiration and is answered by the experiment 2. A hypothesis is suggested and explained using scientific fact 3. All relevant variables, ranges and methods of manipulation are correctly identified 4. The experimental method would require previous knowledge of the experiment to be performed correctly |  |  |

**Criterion C: Processing and Evaluating**

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| **Level** | **Level descriptor** | **Student** | **Teacher** |
| 0 | The student does not reach a standard described by any of the descriptors below. |  |  |
| 1-2 | The student is able to:  i. **collect and present** data in numerical and/or visual forms.  ii. **interpret** data.  iii. **state** the validity of a prediction based on the outcome of a scientific investigation, **with limited success**.  iv. **state** the validity of the method based on the outcome of a scientific investigation, **with limited success**.  v. **state** improvements or extensions to the method that would benefit the scientific investigation **with limited success**. |  |  |
| 3-4 | The student is able to:  i. **correctly** **collect and present** data in numerical and/or visual forms.  ii. **accurately interpret** data and **outline results**.  iii. **state** the validity of a prediction based on the outcome of a scientific investigation.  iv. **state** the validity of the method based on the outcome of a scientific investigation.  v. **state** improvements or extensions to the method that would benefit the scientific investigation. |  |  |
| 5-6 | The student is able to:  i. **correctly** **collect, organize and present** data in numerical and/or visual forms.  ii. **accurately interpret** data and **outline results** using **scientific reasoning**.  iii. **outline** the validity of a prediction based on the outcome of a scientific investigation.  iv. **outline** the validity of the method based on the outcome of a scientific investigation.  v. **outline** improvements or extensions to the method that would benefit the scientific investigation. |  |  |
| 7-8 | The student is able to:  i. **correctly collect, organize, transform and present** data in numerical and/or visual forms.  ii. **accurately interpret** data and **outline results** using **correct scientific reasoning**.  iii. **discuss** the validity of a prediction based on the outcome of a scientific investigation.  iv. **discuss** the validity of the method based on the outcome of a scientific investigation.  v. **outline** improvements or extensions to the method that would benefit the scientific investigation. |  |  |

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| **Student Reflection** |
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| **Teacher Feedback** |
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